U.S. Department
of Transportation

**Federal Aviation
Administration**

U.S. Department of Transportation

Federal Aviation Administration

Specification

DUAL MODE

HIGH INTENSITY APPROACH LIGHTING SYSTEM

(ALSF-2/SSALR)

SPECIFICATION CHANGE NOTICE (SCN)

1. DATE (YYMMOD) 931217	**Form Approved** OMB No 0704-0188

Public reporting burden for this collection of information is estimated to average 2 hours per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Department of Defense, Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4102 and to the Office of Management and Budget Paperwork Reduction Project (0704-0188) Washington DC 20503

2. PROCURING ACTIVITY NO.

3. DODAAC

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO EITHER OF THESE ADDRESSES. RETURN COMPLETED FORM TO THE GOVERNMENT ISSUING CONTRACTING OFFICER FOR THE CONTRACT/ PROCURING ACTIVITY NUMBER LISTED IN ITEM 2 OF THIS FORM.

4. ORIGINATOR

a. TYPED NAME (First, Middle Initial, Last)
Clesson McDonald

b. ADDRESS (Street, City, State, Zip Code)
Federal Aviation Administration,   ANN-600
Washington, DC

5. SCN TYPE
PROPOSED |X| APPROVED

6. CAGE CODE

7. SPEC. NO.
FAA-E-2689a

8. CAGE CODE

9. SCN NO.
4

10. SYSTEM DESIGNATION
ALSF-2/SSALR

11. RELATED ECP NO.
16311

12. CONTRACT NO.

13. CONTRACTUAL AUTHORIZATION

14. CONFIGURATION ITEM NOMENCLATURE

15. EFFECTIVITY
December 9, 1993

This notice informs recipients that the specification identified by the number (and revision letter) shown in Item 7 has been changed. The pages changed by this SCN are those furnished herewith and carry the approval date of the related ECP listed in Item 11. The pages of the page numbers and dates listed in Items 16 and 17, combined with non-listed pages of the original issue of the revision shown in Item 7, constitute the current approved version of this specification.

16. PAGES AFFECTED BY THIS SCN

PAGE(S) a	TYPE OF CHANGE* b	APPROVAL DATE (YYMMDD) c
Page 6a, Paragraph 2.1.3	S	93/12/09
Page 6b, (No Change) Specification Change Notice 3		92/12/09
Page 53, Paragraph 3.2.9.1	S	93/12/09
Page 54, Paragraph 3.2.9.1.2 and 3.2.9.1.2.1	S	93/12/09
Page 54a, Paragraph 3.2.9.1.9	S	93/12/09
Page 54b, Paragraph 3.2.9.1.10	S	93/12/09
Page 66c, Paragraph 3.4.15	S	93/12/09
Page 66d, (No Change) Specification Change Notice 3		92/12/09
Page 66g, Paragraph 3.4.15.3.1	S	93/12/09
(See attached continuation sheets)		

17. SUMMARY OF PREVIOUSLY CHANGED PAGES

SCN NO a	RELATED ECP NO. b	PAGE(S) c	DATE SUBMITTED (YYMMDD) d	TYPE OF CHANGE* e	APPROVAL DATE (YYMMDD) f

* "S" indicates supersedes earlier page.   "A" indicates added page.   "D" indicates deletion

18.a. GOVERNMENT ACTIVITY
Federal Aviation Administration

b. TYPED NAME (First, Middle Initial, Last)
Clesson McDonald, ANN-600

c. SIGNATURE

c. DATE SIGNED (YYMMDD)
931217

DD Form 1696, APR 92   Previous editions are obsolete.

SPECIFICATION CHANGE NOTICE (SCN)   (continuation sheet)

NCP 16311
ALSF-2/SSALR
FAA-E-2689a
SCN No. 4
Effective December 09, 1993

PAGE(s)	Type of Change	Approva Date(YYM
66h, (No Change) Specification Change Notice 3		92/12/09
66i, (No Change) Specification Change Notice 3		92/12/09
66j, Paragraph 3.4.15.3.2.14	S	93/12/09
83, Paragraph 4.4.5.1	S	93/12/09
84, (No Change) Specification Change Notice 3		92/12/09

END OF CHANGES

2.1.3 FAA standards

FAA-STD-013	Quality Control Program Requirements
FAA-STD-019	Lightning Protection, Grounding, Bonding and Shielding Requirements for Facilities
FAA-STD-020	Transient Protection, Grounding, Bonding, and Shielding Requirements for Equipment
FAA-STD-021	Configuration Management (Contractor Requirements)
FAA-STD-024	Preparation of Test and Evaluation Documentation
FAA-STD-025	Preparation of Interface Control Documents
FAA-STD-026	National Airspace System (NAS) Software Development
NAS-MD-790	Remote Maintenance Monitoring System Interface Control Document, Maintenance Processor Subsystem to Remote Monitoring Subsystems and Remote Monitoring Subsystem Concentrators dated June 10, 1986; Change Notice-1 dated September 10, 1991; Change Notice-2 dated November 5, 1991
NAS-MD-793	Remote Maintenance Monitoring System Functional Requirements for the Remote Monitoring Subsystem (RMS)
NAS-IR-5104 5100	Draft Interface Requirements Document, Maintenance Data Terminal (MDT)/Remote Monitoring Subsystem (RMS), dated October 9, 1989
FAA-AP-1990- 4391	Draft Interface Control Document for the Terminal Control Computer Complex/Approach Lighting System (TCCC/ALS) 10/15/90

2.2 Federal publications. - The following federal publications, of the issues in effect on the date of the invitation-for-bids or request-for-proposals, form a part of this specification and apply where specified herein.

2.2.1 Military standards

MIL-STD-129   Marking for Shipment and Storage

MIL-STD-276   Impregnation of Porous, Nonferrous Metal
                   castings

MIL-STD-454   Standard General Requirements for Electronic
                   Equipment

MIL-STD-461   Electromagnetic Emission and Susceptibility,
                   Requirement for the Control of electromagnetic
                   Interference

MIL-STD-462   Electromagnetic Interference Characteristics,
                   Measurement of

MIL-STD-470   Maintainability Program Requirements (For
                   Systems and Equipments)

MIL-STD-471   Maintainability Verification, Demonstration,
                   and Evaluation

MIL-STD-781   Reliability Tests, Exponential Distribution

MIL-STD-785   Reliability Program for Systems and Equipment
                   Development and Production

MIL-STD-810   Environmental Test Methods

MIL-STD-1521   Technical Reviews and Audits for Systems,
                   Equipment and computer software

DOD-STD-2167   Defense System Software Development

2.2.2 Military publications

MIL-HDBK-217   Reliability Stress and Failure Rate Data for
                   Electronic Equipment

MIL-HDBK-472   Maintainability Predictions

RADC-TR-75-22   Nonelectronic Reliability Notebook

3.2.8.7   Semiflush fixtures.- Semiflush fixtures used for the inpavement ALS lights are in accordance with FAA-E-2491.

3.2.9   Remote monitoring subsystem (RMS).- A remote monitoring subsystem shall be supplied with the system and shall:

(a)   provide lightning protection for the input AC power and data transmission link.

(b)   contain sensors required for acquiring the data identified in paragraph 3.2.10 through 3.2.10.5.6.

(c)   contain a versatile module eurocard (VME) backplane bus interface card cage containing all circuitry necessary to (1) accomplish management of the data link, (2) meet the modem requirements, (3) format equipment parameters, (4) transmit data at the proper times to the MPS, and (5) meet all input/output requirements.

(d)   provide interfaces for the maintenance processor subsystem (MPS) and maintenance data terminal (MDT).

(e)   provide the capability to monitor, control, and diagnose ALSF-2/SSALR equipment.

(f)   contain initialization and self-testing capability.

3.2.9.1   General RMS requirements.- The ALSF-2/SSALR RMS shall include voltage and current sensors, cabling, connectors, and mounting hardware necessary to route required signals and control functions to the monitoring units of the ALSF-2/SSALR RMS, and shall include all circuitry necessary to buffer, condition data into engineering units, and preprocess sampled signals. The RMS shall transmit the data to the MPS in accordance with the formats and requirements of NAS-MD-790 (including Specification Change Notice 1 and 2) and shall execute control commands sent by the MPS and MDT.

3.2.9.1.1   MDT interface.- The ALSF-2/SSALR RMS shall be provided with a terminal interface as described in NAS-IR-51045100. The interface shall be wired to a front panel mounted female MIL-C-24308 (MS-18275) connector.

3.2.9.1.2 MPS interface.- The ALSF-2/SSALR RMS shall be provided
with an MPS interface in accordance with NAS-MD-790 (including
Specification Change Notice 1 and 2).

3.2.9.1.2.1 Protocol.- The protocol used to control the MPS data
interface shall be in accordance with ANSI X3.66 as specified in
NAS-MD-790.

3.2.9.1.3 VME bus interface system.- The RMS equipment shall
utilize printed wiring boards meeting all electrical and mechanical
specifications contained in IEEE-P1014 for all RMS circuitry. The
card cage and backplane shall be capable of accommodating the
future addition of at least three VME double-height boards,
physical configuration option NECP, without further modification.
Backplane connectors provided for the purpose of accommodating the
future addition of VME boards shall have user I/O pin assignments
brought to individual solder terminals or connectors suitable for
the future addition of wires.

3.2.9.1.4   Memory.- Memory shall consist of the appropriate
combinations of read-only memory (ROM), programmable read-only
memory (PROM), erasable programmable read-only memory (EPROM),
logic arrays, and random-access memory (RAM). The basic PROM or
EPROM device shall be available to the Government as a commercially
available off-the-shelf item.   The RMS shall have expansion
capabilities as required by paragraph 3.2.9.1.5. and 3.4.14.6.
Memory expansion techniques, i.e., hardware, firmware, or software
changes shall be addressed in the equipment instruction book (see
Paragraph 3.7).

3.2.9.1.4.1   Volatility.- Storage of all control settings,
operational parameters and limits, all initialization data, all
data files and fault history shall be supported with sufficient
battery capacity or other techniques to ensure the non-volatility
of stored data for a period of not less than ninety days. Fault
history shall include the last routine parameter data and the post-
fault (prior to alarm) parameter data for the last ten system
faults.

3.2.9.1.5 RMS expansion.- In addition to all other requirements
specified herein, the ALSF-2/SSALR RMS shall have, as a minimum,
20 spare analog input, 15 spare digital input, and 10 spare digital
output lines. The capability for utilizing these input
and output lines shall not be implemented; however, the original
hardware, firmware, and software shall be designed for future

utilization of these lines with minimal modification. The analog
input shall be a differential input and shall enable the RMS to
provide a digital output signal representing the input value. A
signal comparator having two (2) sets of adjustable thresholds, one
(1) for alarms and one (1) for alerts, shall be provided. These
thresholds shall be programmable in 100 millivolt steps throughout
the range of the voltage input. The RMS shall not introduce or
cause an error in the true analog reading in excess of ±0.1 volt.
The input impedance of the analog input shall be greater than one
megohm.

3.2.9.1.6 Test points.- The RMS equipment design shall incorporate
indicators, warning signals, test jacks, and test points to
facilitate troubleshooting and malfunction isolation. Test points
shall be provided to check critical timing waveforms, power supply
output voltages, and for the injection of test signals. The test
points shall be located for easy accessibility. Their locations
shall be kept to a minimum, and each shall be labeled for easy
identification and reference to maintenance data, and shall be
designed for easy attachment of test probes and test equipment.

3.2.9.1.7 Indicator lights.- Indicator light(s) shall be provided
on the cabinet front panel to indicate application of power.

3.2.9.1.8 Reset switch.- Each unit employing microprocessors
shall have a front panel mounted, momentary contact switch labeled
"reset". Activation of the reset switch shall cause all program
variables and all software/firmware controlled hardware to be
initialized to a predefined condition from which normal program
execution can continue. The MPS shall be notified of a change of
state in accordance with NAS-MD-790.

3.2.9.1.9 Environmental sensors.- The following sensors together
with all necessary cabling, connectors, terminal boards,
enclosures, mounting hardware, and installation and maintenance
instructions shall be provided with each ALSF-2/SSALR equipment as
specified below. Measurements from the sensors shall be processed
by the RMS for transmission to the MPS at appropriate times and for
output locally via the MDT interface.

    (a)   Intrusion detector (2 each)
    (b)   Smoke detector   (2 each)
    (c)   AC power
    (d)   E/G power
    (e)   Inside temperature (2 each)
    (f)   Outside temperature

These sensors shall meet the requirements of paragraphs 3.2.10.5
through 3.2.10.5.6.

3.2.9.1.10 Data communications failures.- When data communication
failures between the RMS and the MPS occur, the retry and
continuous polling procedures of paragraph 3.8 of NAS-MD-790 shall
be implemented. Additionally, the ALSF-2/SSALR RMS shall have at
least one (1) megabyte of storage for automatic storage of all
ALSF-2/SSALR equipment data during communications failures.

3.2.10 RMS performance parameter monitoring requirements.- The
following performance parameters shall be monitored. The
availability and use of these parameters shall be accomplished
without interruption to normal operation.

3.2.10.1 System status parameters.- As a minimum, the status of
the following ALSF-2/SSALR and environmental parameters shall be
monitored: All the ALSF-2/SSALR monitored parameters of table Xa,
and all system input voltages and currents, all cabinet, regulator,
subsystem input and output voltages and currents, and all power
supply input and output voltages and currents. See paragraph
3.4.15.3.2.2.

3.2.10.1.1 Sensors.- Sensors (transducers) and signal conditioning
equipment shall be provided to allow the monitoring subsystem to
reliably detect lamp or lamp bar malfunctions and compute the
caution and failure signals required by table VI in 3.2.4.5.2.

3.2.10.2 Key equipment performance parameters.- ALSF-2/SSALR and
associated equipment key performance parameters (also referred to
as standards and tolerances) shall be available for automatic
monitoring at the MPS interface and demand monitoring at both the
MPS and MDT interfaces. These parameters are identified in table
VI. Soft alarm (alert/caution) and hard alarm (failure) processing
shall meet the requirements of paragraphs 3.2.4.5 and 3.2.5.1.7.

3.2.10.3 ALSF-2/SSALR certification parameters.- The
certification parameters as indicated in table Xb shall be
available for automatic monitoring at the MPS interface and demand
monitoring at both the MPS and MDT interfaces.

3.2.10.4 ALSF-2/SSALR key performance checks.- Performance
checks (or equivalent measurements) required for the ALSF-2/SSALR
in the instruction book (see paragraph 3.7.1) shall be available
for demand monitoring at the MPS and MDT interfaces.

3.4.14.6 System growth capabilities.- The processing configuration
(including microprocessors and microcomputers) shall provide the
following capabilities for growth:

(a) Memory: The computer configuration shall include
     sufficient capacity to accommodate an increase of on-half
     in all computer program modules and data
     structures with no modifications in equipment, no
     restructuring of modules or data structures, and no
     resequencing of input/output operations.

(b) Central processing unit (CPU):   Under worst-case CPU
     loading, the delivered CPU usage shall not be greater
     than 75 percent of capacity.

(c) Upward expandability: The delivered configuration shall
     either include, or permit by addition of units without
     induced change, modification, or redesign to the
     software/hardware components comprising the basic
     configuration a further 100 percent increase in the
     capacity of primary memory.

All of these margins for growth shall exist at the time of
delivery. Analysis, proving that the requirements are met, shall
be presented at PDR and CDR for Government approval.

3.4.15 RMS functional requirements.- The ALSF-2/SSALR RMS shall
meet the functional requirements of NAS-MD-793 as augmented below
and the requirements of NAS-MD-790. All data provided to the RMS
interfaces (parameter values, measurements, standards, tolerances,
and diagnostic test results) shall be conditioned and reported in
the correct engineering units. The RMS data transmitted over the
data link between the ATCT and the ALSF-2 substation shall utilize,
as a maximum, one unshielded, twisted pair of 19 gauge wire.

3.4.15.1 Monitoring requirements.- All monitored data and
reports shall be time stamped at the RMS. In addition, the RMS
shall monitor environmental parameters to provide data on the
ambient environmental and physical security conditions at the ALSF-
2/SSALR equipment and engine generator shelters. Table XIVa lists
the controlled functions of the monitoring system.

3.4.15.2 Alarm limits.- ALSF-2/SSALR and environmental equipment
parameter values shall be collected on a regular and frequent basis
(see 3.4.15.7.3). The RMS shall process the outputs of the sensors
to determine hard and soft alarm status by comparing the monitored
outputs with predetermined values.   All hard and soft
alarm thresholds shall be site adaptable. Thresholds for
currents and voltages shall be adaptable to ± 40 percent of their
specified values.

TABLE XIVa.   ALSF-2/SSALR CONTROLLED FUNCTIONS

Controlled Function	Possible Status
ALSF-2/SSALR (available to both the local maintenance data terminal and the maintenance processor sub-system)	
RMS Diagnostics	(PASSED/FUNCTION "X" FAILED)
ALSF-2/SSALR Diagnostics	(PASSED/LRU, LIGHT BAR, and/or LAMP "X" FAILED)
Establish System Parameters	PARAMETERS TEMPORARILY/ PERMANENTLY) INSTALLED
Alarm, Alert Enable/Disable	(ENABLE/DISABLE)
Reset ALSF-2 RMS	RESET (SUCCESSFUL/UNSUCCESSFUL)
Reset ALSF-2 Microprocessors (when used)[1]	RESET (SUCCESSFUL/UNSUCCESSFUL)
ALSF-2/SSALR (available from local maintenance data terminal)	
a. Display Menu	-
b. Display System Status	-
c. Display Certification Parameters	-
d. Display Performance Checks	-
e. Display Key Equipment Performance Parameters	-
f. Display Status of a Parameter	-
g. Abort Command in Progress[2]	-
h. Time synchronization	-
i. ALS	(ON/OFF)

Table XIVb.   RMS Operating Modes and Configurations

Modes and Configurations	RMS Status		RMS Control		Other
	MPS	MDT	MPS	MDT	
Remote Mode					
MDT not logged in	Yes	No	Yes	No	RMS provides Login Prompt to the Local Terminal Interface
MDT logged in	Yes	Yes	Yes	No	
Local Mode (MDT logged in)	Yes	Yes	No	Yes	

3.4.15.3.1 MPS interface commands.- In addition to the capability to respond to the polling requirements of NAS-MD-790, the following commands shall be incorporated into the RMS and shall be executed upon receipt of commands from the MPS interface.

    (a) Diagnostic routine check (3.4.15.3.2.8)

    (b) Turn approach lights on (3.4.15.3.2.10)

    (c) Brightness step (1-5) (3.4.15.3.2.11)

    (d) Flasher lights on (3.4.15.3.2.12)

    (e) Reset (3.4.15.3.2.13)

    (f) Time synchronization with MPS (3.4.15.3.2.14)

3.4.15.3.2 MDT interface commands.- The following command shall be incorporated into the RMS and shall be executed upon receipt of commands from the MDT interface.

    (a)   Display menu (3.4.15.3.2.1)

    (b)   Display system status (3.4.15.3.2.2)

    (c)   Display certification parameters (3.4.15.3.2.3)

    (d)   Display performance checks (3.4.15.3.2.4)

    (e)   Display key equipment performance parameters (3.4.15.3.2.5)

    (f)   Display status of a parameter (3.4.15.3.2.6)

    (g)   Abort command in progress (3.4.15.3.2.7)

    (h)   Diagnostic routine check (3.4.15.3.2.8)

    (i)   ALSF-2/SSALR mode (3.4.15.3.2.9)

    (j)   Turn approach lights on/off (3.4.15.3.2.10)

    (k)   Brightness step (1-5) (3.4.15.3.2.11)

    (l)   Flasher lights on/off (3.4.15.3.2.12)

    (m)   Reset (3.4.15.3.2.13)

3.4.15.3.2.1 Display menu command.- The ALSF-2/SSALR RMS shall include a display menu command. Execution of the display menu command shall provide a listing of all menu items including the commands in 3.4.15.3.2 above.

3.4.15.3.2.2 Display system status.- The ALSF-2/SSALR RMS shall implement a display system status command. The display system status command shall be executed upon receipt of a unique command. Execution of the display system status command shall provide a report of the status of the ALSF-2/SSALR and environmental equipment including as a minimum the ALSF-2/SSALR monitored parameters of table Xa. The report shall also contain, all system input voltages and currents, all cabinet, regulator, subsystem input and output voltages and currents, and all power supply input and output voltages and currents. See paragraph 3.2.10.1.

3.4.15.3.2.3 Display certification parameters.- The AlSF-2/SSALR RMS shall implement a display certification parameters command. This command shall be executed upon receipt of a unique command and provide a report containing the date and time, the services provided, the certification parameters, standards and tolerances, and measured values as identified in paragraph 3.2.10.3.

3.4.4.15.3.2.4 Display performance checks.- The ALSF-2/SSALR
RMS shall implement a display performance checks command. This
command shall be executed upon receipt of a unique command and
provide a report containing the date and time, periodicities of
performance checks, performance checks, standards and tolerances,
and measured values as identified in the instruction book (see
paragraph 3.2.10.4).

3.4.15.3.2.5 Display key equipment performance parameters.- The
ALSF-2/SSALR RMS shall implement a display key equipment
performance parameter command. This command shall be executed upon
receipt of a unique command and provide a report containing the
date and time, inside temperature, outside temperature,
parameters, standards and tolerances, alarm status, and measured
value as identified in the instruction book (see paragraph
3.2.10.2).

3.4.15.3.2.6 Display status of a parameter command.- The
ALSF-2/SSALR RMS shall implement a display status of a parameter
command. The display status of a parameter command shall be
executed upon receipt of a unique command. It shall be possible to
separately specify each of the parameters of 3.4.15.3.2.2,
3.4.15.3.2.3, 3.4.15.3.24., and 3.4.15.3.2.5.   The single line
shall contain the parameter name, standard, the alarm status, and
monitored value (as applicable) for that parameter exactly as the
line for that parameter would be displayed in the reports
specified.

3.4.15.3.2.7 Abort command in progress.- The ALSF-2/SSALR RMS
shall implement an abort command in progress command. This command
shall be available only for commands that take more than 20 seconds
to implement.   Execution of the abort command in progress command
shall cause the RMS to cease execution of any interface command
currently being executed.

3.4.15.3.2.8 Diagnostic routine check.- The ALSF-2/SSALR RMS shall
implement the diagnostic routine check command. The command shall
be executed upon receipt of a unique command from either the MDT or
MPS interface. Execution of the diagnostic routine check shall
cause the RMS to execute the diagnostic routine of 3.4.15.4. The
results of the diagnostic shall be sent by the RMS to the
requesting interface.

3.4.15.3.2.9 ALSF-2/SSALR mode.- The ALSF/SSALR RMS shall
implement the ALSF-2/SSALR mode command. The command shall be
executed upon receipt of a unique command from the MDT interface.
Execution of the command from the MDT or the MPS shall cause the
RMS to change from ALSF-2 mode of operation to SSALR mode or vice
versa.

3.4.15.3.2.10 Turn approach lights on/off.- The ALSF/SSALR RMS shall implement the turn approach lights on/off command. The on/off command shall be executed upon receipt of a unique command from either the MDT or MPS interface. Execution of the on/off command shall cause the approach lights to be activated or deactivated.

3.4.15.3.2.11 Brightness step (1-5).- The ALSF/SSALR RMS shall implement the brightness step commands. The command shall be executed upon receipt of a unique command from either the MDT or MPS interface. Execution of the command shall cause the approach lights to be stepped from brightness steps one to two, two to three, three to four, and four to five as well as the reverse order. Execution of the reverse order of brightness steps from the MPS interface shall not be allowed.

3.4.15.3.2.12 Flashing lights on/off.- The ALSF/SSALR RMS shall implement the flashing lights on/off command. The on/off command shall be executed upon receipt of a unique command from either the MDT or MPS interface. Execution of the on/off command shall cause the flashing lights to be activated or deactivated.

3.4.15.3.2.13 Reset.- The ALSF-2/SSALR RMS shall implement a reset command. Execution of the reset command shall cause the RMS to reset the RMS and initiate the time synchronization sequence of paragraph 3.4.15.3.2.14 below.

3.4.15.3.2.14 Clock sync request message.- The RMS shall provide a clock sync request message in accordance with NAS-MD-790, paragraph 3.5.4.   The clock sync request message shall be automatically generated for transmission to the MPS whenever the RMS recovers from a power fault and whenever the RMS is reset. In addition, the RMS shall also generate clock sync request messages to the MPS at intervals frequent enough to maintain the RMS time to within six seconds of MPS time but not more frequently than once every twelve hours and not less than once every twenty-four hours. Execution of this command shall cause a software routine to synchronize the RMS clock to within two (2) seconds of the MPS clock.

3.4.15.3.2.14.1 Clock sync message.- The RMS shall accept and execute a clock sync message from the MPS in accordance with NAS-MD-790, paragraph 3.5.5.

3.4.15.3.2.14.2 Clock delay adjustment.- The RMS shall be capable of incorporating a site adaptable, fixed time delta to account for transmission delays in the clock update routine.

4.4.5 150-hour test.- The system shall be connected together in accordance with 4.3.3 and tested as a system for a minimum of 150 hours at an ambient temperature of 30 degrees $\pm$ 10 degrees C (86 degrees $\pm$ 18 degrees F). Each functional control, brightness selector, mode control, status indicator, alarm circuit, and monitor channel shall be exercised to demonstrate full compliance with the specification. Any erratic switching, loss of control, or operation outside of the prescribed limits shall be cause for rejection. Operation of the monitor subsystem for loop 1, 2, and 3 shall be tested with the shorting devices installed in the PAR-56 lampholders. The following steps shall be performed during the test period:

(a)   Each function (brightness and mode changes) shall be exercised at least once each hour during the test period.

(b)   Each brightness level settings (B1 through B5) shall be activated for 3.5 minutes in each mode (ALSF/SSALR) every 10 hours.

(c)   The system shall operate on each brightness level setting (B1 through B5) and each mode (ALSF/SSALR) for 10 hours, except for the hourly interruption mentioned in step (a).

(d)   The proper operation of the alarm circuit shall be demonstrated by removing 10 lamps in each loop of the ALSF and SSALR circuits, and 3 lamps int he flashing light circuit. The test shall be done at the end of the 10 hour test (step (c)), and at the conclusion of the 150 hour test.

4.4.5.1 RMS operational test.- The ALSF-2/SSALR RMS functional requirements shall be tested using an MPS simulator. The synchronous MPS communications simulator, hereinafter referred to as the simulator, provides a means of simulating the communication functions, as defined below, of a single channel of an MPS. The data communications protocol between the simulator and RMS is as defined by the Remote Maintenance Monitoring Subsystem (RMMS) Interface Control Document, NAS-MD-790. The simulator is designed to run on an IBM or an IBM-compatible personal computer (PC) with MS-DOS release 2.0 or higher and a minimum of 320K bytes of random access memory (RAM) with government furnished software that simulates an MPS interface to the RMS. The simulator hardware shall be provided by the contractor. The PC must also have an IBM synchronous data link control (SDLC) communications adapter card, an external clock with a baud rate of 2400 at RS-232 level, and a parallel printer port.

4.4.6 Regulator tests.- The tests as specified herein shall be performed on the regulators.

4.4.6.1 Regulation.- The regulators shall be tested to demonstrate full compliance with the requirements of 3.2.3.2. For production units, regulation need only be tested at nominal input voltage. Regulation testing shall also demonstrate compliance with the local and remote control and monitor requirements of 3.2.3.12 and 3.2.3.13.

4.4.6.2 Temperature rise.- Temperature rise testing as required by 3.2.3.5 shall be performed using the resistance method.

4.4.6.3 Efficiency.- The regulator shall be tested to demonstrate the efficiency requirement of paragraph 3.2.3.3.

4.4.6.4 Power factor.- The regulator shall be tested to demonstrate the power factor requirements of paragraph 3.2.3.4.

4.4.6.5 Open circuit, over current, and surge protection.- Testing shall be provided to demonstrate compliance with the requirements of 3.2.3.7, 3.2.3.8, 3.2.3.9, and 3.2.3.14.

4.4.7 Control functions tests.- Testing shall be provide for the control subsystem as required herein.

4.4.7.1 Control testing.- A test shall be provided which exercises each control on both substation control panel and the remote control panel, reads the status of each indicator, verifies proper timing relation, and demonstrates compliance with the functional requirements of 3.2.4.4.

4.4.7.2 Data transmission.- The output level and carrier detect specifications of the data transmission link shall be verified by testing. The transmission line loss may be simulated by an attenuator pad in lieu of having an actual 10 mile (16.1 km) transmission line. The mark and space transmitting frequencies shall be verified.

4.4.8 Operational monitor tests.- Tests shall be performed on the operational monitor subsystem as specified herein.

4.4.8.1 Operational monitor operation.- The ability of the operational monitor to detect the number of failed lamps (either open or shorted) in each loop within one lamp shall be verified by tests. The ability shall be tested in all brightness levels and in both modes (ALSF-2/SSALR). The system shall be able to detect from 1 to 10 failed lamps in ALSF-2 and from 1 to 5 in SSALR.